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Author(s): Harry Sharp and Allan Feldt
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SOME FACTORS IN A PROBABILITY SAMPLE SURVEY OF A METROPOLITAN COMMUNITY *

HARRY SHARP AND ALLAN FELDT
University of Michigan

Surveys conducted by the University of Michigan's Detroit Area Study in 1956, 1957, and 1958 employed an area-probability sample of metropolitan Detroit adults. No substitutions were permitted, nor was a specific limit put on the possible number of call-backs. To achieve the 2,313 interviews necessary for an 87 per cent response rate, a total of 7,743 calls was required. Although three-quarters of the completed interviews were obtained after three calls, there is evidence that biases in the sample would have resulted had the interviewing stopped after two call-backs. Available data indicate that the amount of dissimilarity between respondents and nonrespondents is probably not large enough to influence the representativeness of the completed sample, given the response rate of these surveys.

FEW students of survey research would challenge the claim that sampling techniques based on strict probability models afford far more reliable and valid results than do other types of sampling.[1] To be sure, for some purposes and under some conditions quota samples and "modified" probability samples may actually be preferable to more rigorously designed research; but even in these situations most survey researchers would prefer to base their analyses on probability models, if costs and time were not considerations.[2]

A basic charge leveled against quota sampling is that ultimately the interviewer is also the sampler. The interviewer makes the final decision as to which of the many units in the research universe will fall into the sample. He may choose to interview those persons within his quota who are most willing to be respondents and are easiest to locate. It does not necessarily follow that these "volunteers" are a representative sample of all possible units with similar quota characteristics.[3] They could, in truth, be representative, but there is no statistically accept-

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[1] One exception to this claim may be found in Francis E. Lowe and Thomas E. McCormick, "Some Survey Sampling Biases," *Public Opinion Quarterly,* 19 (Fall, 1955), pp. 303–315. These authors conclude: ". . . it remains to be demonstrated that, for ordinary polling purposes, a random sample, in the usual statistical sense, can be drawn with confidence from human populations under a democratic way of life, with prevailing field methods." (p. 315) It has been demonstrated repeatedly that an adequately designed probability sample is capable of producing units which are representative, within known confidence limits, of a given research universe. See, e.g., C. A. Moser and A. Stuart, "An Experimental Study of Quota Sampling," *Journal of the Royal Statistical Society,* A, 116 (1953), pp. 349–405; Leslie Kish, "A Procedure for Objective Respondent Selection Within the Household," *Journal of the American Statistical Association,* 44 (September, 1949), pp. 380–387; Bernard R. Berelson, Paul F. Lazarsfeld, and William N. McPhee, *Voting,* Chicago: University of Chicago Press, 1954, Appendix C; *A Social Profile of Detroit: 1956,* Ann Arbor: The Detroit Area Study, 1957, Appendix A. See also Morris H. Hansen, William N. Hurwitz, and William G. Madow, *Sample Survey Methods and Theory,* New York: Wiley, 1953, Volume I, Chapter 1.

[2] W. R. Simmons and others recently made this point during a panel discussion of the question, "Is Probability Sampling Overdone?" at the 1958 meeting of the American Association for Public Opinion Research. Simmons' conclusion was that true probability sampling is underdone. "Proceedings of the Thirteenth Conference," *Public Opinion Quarterly,* 22 (Summer, 1958), p. 208. See also C. A. Moser, *Survey Methods in Social Investigation,* New York: Macmillan, 1958, pp. 106–108.

[3] Evidence from an experimental study in England indicates that on many items quota samples do not differ greatly from random samples. On some very crucial items, however, the quota sample is drastically in error. In addition to large biases, the variance of the quota samples in this research were from 150 per cent to about 400 per cent larger than the random sample variance. Thus, in terms of standard error per dollar the quota sample actually may be more expensive than a probability sample. Moser and Stuart, *op. cit.*

able method by which confidence limits for a nonprobability sample can be ascertained.

In a strict probability sample all units in a defined universe are given an equal or known nonzero chance of being selected. The interviewer has no opportunity whatsoever to determine the specific units which he must contact. Unfortunately, the problem of obtaining a representative sample with known confidence intervals is not solved simply by drawing a probability sample. This would be the case only if (1) all units which fell into the original sample yielded a completed interview, or if (2) nonrespondents differed from respondents solely in their failure to grant an interview. The dilemma for probability sampling on most human populations is that neither of these conditions holds.

Survey researchers have grappled with the nonresponse problem for many years.[4] A considerable body of valuable data is now available which can help in making estimates of costs and in anticipating and correcting biases and weak points in the interviewing stage of a survey. Few studies of response rate which are readily accessible, however, have centered on a large metropolitan area in the United States. Almost all of our information about this important aspect of survey research is based upon studies of relatively small communities or of the entire nation. To an ever increasing extent the metropolitan community is of central interest to the social sciences. In the present paper an attempt is made to describe in some detail the factors which are involved in carrying through a large-scale survey in a metropolitan center with a population of over three and one-half million persons.

THE DATA

Each year since 1952 The University of Michigan's Detroit Area Study[5] has conducted an annual survey of the adult population of the Detroit metropolitan community. This discussion focuses on the surveys of 1956, 1957, and 1958. The objectives of these surveys required a sample of the adults of greater Detroit which would be representative, within known confidence limits, of all noninstitutionalized adults in the community.[6]

Area-probability samples were constructed for this research which allowed the assignment of specific addresses at which interviews were to be obtained.[7] No substitutions of any kind were permitted. The interviewer's first task at a designated dwelling unit was to select from all adult residents one person as the respondent. The selection was predetermined for the interviewer, following a method described in the literature.[8] Again, no substitutions were permissible at this stage of the sample design.

All three surveys used an interview schedule which required an average of one hour and ten minutes to administer. Standard open-ended and closed-answer questions were employed in about equal numbers. The topic of the research, of course, varied each year.[9]

In each of these surveys detailed information was gathered about the interviewing stage. The situation surrounding every contact at every sample address was noted fully by the interviewer. The analyses of these data should present some valuable insights

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[4] Nonresponse is also an important concern of compulsory censuses. See Morris H. Hansen, William N. Hurwitz, and Leon Pritzker, "The Accuracy of Census Results," *American Sociological Review,* 18 (August, 1953), pp. 416–423.

[5] The Detroit Area Study is associated with the Department of Sociology and the Survey Research Center of the Institute for Social Research at the University of Michigan.

[6] The comparability of Detroit Area Study sample distributions with those of the Census attest to the validity of the sample. See *A Social Profile of Detroit: 1956, loc. cit.*

[7] Detroit Area Study samples were clustered and stratified to meet the needs of the research projects. Detailed descriptions of the specific probability models used in each survey are available from the Detroit Area Study. The sample universe, which is that part of the greater Detroit area that is tracted by the Census, includes about 87 per cent of the population of the three-county Detroit Standard Metropolitan Area. The samples were designed by the Sampling Section of the Survey Research Center.

[8] Kish, *op. cit.*

[9] In 1955–56 the facilities of the Detroit Area Study were used by Robert C. Angell for research in normative integration, and by Robert Weiss and Robert Kahn for a study of the sociology of work. Daniel Katz and Samuel Eldersveld investigated political behavior in 1956–57. Gerhard Lenski's research on the religious life of greater Detroit took place in 1957–58. Interview schedules used in these surveys are available from the Detroit Area Study. No evidence is available that the content of a specific study influenced that survey's response rate.

TABLE 1. DISTRIBUTION OF CALLS BY NUMBER AND RESULT AT EACH SAMPLE ADDRESS

Result of Call	Percentage Distribution by Number of Calls						Mean No. of Calls
	One	Two	Three	Four	Five or More	Total Sample	
Completed interview	28	36	28	31	25	87	2.6
Refusal or "too busy"	20	16	21	15	18	8	4.6
Respondent not home	20	14	15	16	13	3	6.4
No one home	30	32	34	37	43	1	7.0
Respondent ill, senile	1	1	1	1	1	1	3.2
Language problem	1	1	1	*	*	*	3.7
Total	100	100	100	100	100	100	2.9
Number of cases	2,646	1,888	1,164	767	1,278	2,651	7,743

* Less than 0.5 per cent.

into the processes by which metropolitan samples based on probability models are constructed "call-by-call." As much information as possible was collected on the characteristics of nonrespondents. These data are presented in the final section of the paper. For convenience, the combined samples are discussed below as though they constituted a single survey.

A combination of budgetary considerations and estimates of tolerable confidence limits yielded 2,651 addresses in the original sample which contained eligible respondents. It was determined that a sample of this size should produce the desired number of completed interviews. This decision was predicated on a final response rate of 85 per cent.

No cross-sectional metropolitan survey, of course, can plan on a 100 per cent response rate. Even if every designated respondent were willing to grant an interview, the cost involved in reaching the total sample would be prohibitive. In general, experience has shown that, first, per unit interviewing costs in time and money rise dramatically after a response rate of about 75 per cent is reached, and, second, the distortion in the completed sample due to nonresponse does not seem to be excessive when the proportion of nonresponse is not more than 15 to 18 per cent of all possible interviews. A balancing of these considerations with the desire to achieve perfection in response led to the decision to settle for 85 per cent completion. Nonetheless, any specific response rate figure is unavoidably arbitrary.

RESPONSES AND NONRESPONSES

The 1956–58 Detroit Area Study surveys actually produced 2,313 interviews for a final response rate of 87 per cent (see Table 1). Eighty-seven out of every 100 adults in the sample were interviewed only with the help of an intensive campaign in which the interviewer himself was perhaps the most crucial figure.[10]

All sample addresses were sent letters (first-class mail) which heralded the arrival of an interviewer, explained the purpose of the survey, and stressed the fact that no product or service was being sold. The interviewers were also aided by several newspaper articles which described the research and explained the necessity of talking with a certain individual in a certain family. The actual value of these devices in reducing the nonresponse rate is debatable. There is some evidence that their primary effect is that of solidifying the incipient negative or positive attitudes toward an interview held by designated respondents. Most interviewers encourage the use of letters and advance publicity, however, because "they serve as an excellent introduction and ease the initial contact with many respondents."[11]

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[10] For a comprehensive discussion of the role played by the interviewer in the efforts to achieve a low nonresponse rate, see Robert L. Kahn and Charles F. Cannell, *The Dynamics of Interviewing,* New York: Wiley, 1957, pp. 65–91.

[11] Charles F. Cannell, "Factors Affecting the Refusal Rate in Interviewing," a paper presented at the 1949 meeting of the American Statistical Association, p. 7 (mimeographed).

Detroit Area Study interviewers were highly trained in that extremely important phase of survey research which occurs when the interviewer first meets the respondent. A discussion of the techniques of probability sampling also is a basic part of interviewer training, for the interviewer often must convince the respondent of the necessity of interviewing him, rather than his wife (who "really knows much more about this than I do") or his neighbor (who "just sits around all day anyway").

In the modern heterogeneous metropolitan community a small number of non-English speaking respondents inevitably are included in samples. The Detroit Area Study was able to handle the majority of such persons by employing a Polish-speaking interviewer, who translated the schedule and interviewed in this language. One per cent of our total sample addresses resulted in an interview rather than a nonresponse because of this provision.

Thirteen per cent of the eligible adults in the sample did not grant an interview. The majority of the nonrespondents, but only eight per cent of the total sample, was classified as refusals.[12] In survey research of this type "refusals" vary from the rare person who is extremely discourteous and seems to gain some psychological satisfaction from slamming the door in an interviewer's face to the timid and retiring housewife who personally would be happy to grant an interview but has been forbidden to do so by her husband.

At only four per cent of the total sample addresses was it impossible to contact the designated respondent.[13] The incidence of not-at-homes was kept to a minimum by interviewer calls at any hour of the day or night which would suit the convenience of the respondent. Also, interviews were occasionally made at places of work or recreation.

Around one per cent of the adult residents of any large community cannot be interviewed because of physical or mental deficiencies. Short of excluding them from the sample by definition, clearly a questionable procedure, no amount of effort or money can reduce the number of such persons.

THE PROBLEM OF CALL-BACKS

By far the greatest contribution to a successful survey is the willingness to make repeated calls at dwellings which do not yield interviews on the first call. No specific limit to the number of calls per dwelling was established for the Detroit Area Study research. Interviewers continued their efforts until one of four contingencies occurred: (1) an interview was granted, (2) a final and definite refusal resulted, (3) the designated respondent was judged physically or mentally incapable of granting an interview, or (4) a satisfactory response rate was reached.

Call-backs are an expensive element in survey research.[14] Two basic techniques have been developed in an attempt to reduce or eliminate the need for repeated calls with probability samples. The first device involves the selection of a subsample of that portion of the original sample that cannot be reached on the first call. Intensive effort is then made to obtain complete returns from the subsample. This scheme includes appropriate weighting of the original sample and the subsample so as to achieve an unbiased result at lowest cost.[15] In the second technique interviewers call on each sample address only once. This visit is made at a randomly designated time. Each respondent supplies information about his presence or absence from home during a randomly selected time on each day of the week preceding the single interviewer contact. Weights are assigned on the basis of probabilities of being interviewed on the first call. The weighted sample is then used in all further analysis.[16]

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[12] This refusal rate is in line with that found in similar surveys reported by Frederick F. Stephan and Philip J. McCarthy, *Sampling Opinions,* New York: Wiley, 1958, p. 262.

[13] Stephan and McCarthy (*Ibid.,* pp. 241–242) indicate that in most surveys it may be expected that the noncontacted group will run between 3 and 8 per cent of the total sample.

[14] J. Durbin, however, claims that while repeated contacts necessarily raise the total cost of a survey, the average cost per interview is not increased greatly by call-backs. "Non-Response and Call-Backs in Surveys," *Bulletin of the International Statistical Institute,* 34 (1954), pp. 3–17.

[15] See Morris H. Hansen and William N. Hurwitz, "The Problem of Non-Response in Sample Surveys," *Journal of the American Statistical Association,* 41 (December, 1946), pp. 517–524. Although this article specifically refers to first contacts based on mail questionnaires, the principles discussed here are applicable to standard personal interview surveys.

Considerable controversy exists concerning the reliability of each of these methods, their administrative efficiency, the problems they introduce in analysis, the degree to which they require an accurate and difficult to obtain foreknowledge of interviewing costs, and the degree to which over-all costs are actually reduced through their use.[17] Until these techniques are further refined or new methods for eliminating call-backs are devised, most survey researchers would probably prefer to lower the nonresponse rate by repeated, although costly, interviewer contacts.

NUMBER OF CALLS FOR RESPONDENTS AND NONRESPONDENTS

The Detroit area research necessitated an over-all average of almost three individual contacts at each sample address to achieve the desired number of interviews. The mean number of calls, moreover, shows great variation according to the final disposition of the address (see Table 1). It is perhaps paradoxical that completed interviews evidence by far the lowest mean number of calls. The average interview was obtained after only 2.6 calls; interviewers found it necessary to call on the average nonrespondent almost twice as frequently.

Not-at-homes have a substantially higher mean number of calls than refusals. Six or seven contacts were made, on the average, in an effort to reach those adults who are at home only to sleep or who may be on vacation or, possibly, who never answer the door. Our experience with this group of unreachables indicates that for all practical purposes they are almost impossible to contact under any conditions. Obviously, "increasing the number of calls is not enough, by itself, to do away with [sample] mortality." [18]

The average refusal was not so designated until 4.6 calls were made at his home. Only the most adamant nonrespondents were classified as refusals on the basis of a single display of uncooperativeness. In these very rare cases it did not appear physically safe for the interviewer to attempt to complete an interview.

Most adults who refused on the first contact were sent a second letter which again explained the study and pleaded for cooperation. Approximately one-half of these persons later granted an interview when contacted by a different interviewer. The likelihood of a response or a nonresponse resulting from a given call is understandably influenced by the previous calls that may have been made at that address. Well-trained interviewers record all information produced by earlier unproductive calls that may be helpful in winning an eventual interview.

The chances of a successful first call, at least in metropolitan Detroit, are no better than three out of ten (see Table 1),[19] and are about equal to the chances of finding no one at home in the dwelling. In two out of ten first contacts the designated respondent either straightforwardly refuses or states that he is too busy at the moment to grant an interview. When the latter claim is made, the interviewers attempt to obtain an appointment when an interview will be granted.

The correct respondent is not at home in 20 per cent of the first calls, although someone is in the dwelling to provide information upon which intelligent call-backs can be planned. Efficient interviewers can often use this person, who is usually the spouse of the designated respondent, as a liaison between

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[16] See Alfred Politz and Willard Simmons, "An Attempt to Get the 'Not-at-Homes' into the Sample Without Call-Backs," *Journal of the American Statistical Association,* 44 (March, 1949), pp. 9–31. More recently, Simmons has modified this technique so that two or more calls are required; weights are applied to completed interviews which are appropriate for the number of calls required to obtain a given interview. See Simmons, "A Plan to Account for 'Not-at-Homes' by Combining Weighting and Call-backs," *The Journal of Marketing,* 19 (July, 1954), pp. 42–53.

[17] Reviews and evaluations of each technique are found in Stephan and McCarthy, *op. cit.,* pp. 255–261; and Moser, *op. cit.,* pp. 135–139.

[18] Stephan and McCarthy, *op. cit.,* p. 239.

[19] Researchers in Elmira, New York, and Madison, Wisconsin, also report a ratio of approximately three interviews for every ten sample addresses contacted for the first time. See Robert Williams, "Probability Sampling in the Field: A Case History," *Public Opinion Quarterly,* 14 (Summer 1950), pp. 316–330; and Lowe and McCormick, *op. cit.* An English study, however, was able to achieve a four in ten ratio for successful first calls; Moser, *op. cit.,* p. 135.

TABLE 2. DISTRIBUTION OF CALLS FOR COMPLETED INTERVIEWS BY SELECTED DEMOGRAPHIC CHARACTERISTICS OF RESPONDENTS

Demographic Characteristics	Number of Cases	Percentage Distribution by Number of Calls					Mean No. of Calls
		One	Two	Three	Four or More	Total	
All Respondents	2,313	32	30	14	24	100	2.6
Employment Status							
Employed	1,357	21	31	18	30	100	3.0
Not employed	952	48	28	9	15	100	2.1
Age							
21–29 years	508	34	28	14	24	100	2.5
30–39 years	634	28	33	14	25	100	2.7
40–49 years	455	29	34	15	22	100	2.6
50–64 years	502	32	25	16	27	100	2.8
65 years or older	212	47	25	11	17	100	2.2
Marital Status							
Never married	186	28	21	14	37	100	3.3
Divorced, separated	105	26	24	16	34	100	3.2
Widowed	163	45	23	11	21	100	2.3
Married, no children present	864	31	26	16	27	100	2.8
Married, children present	990	33	36	13	18	100	2.3
Sex							
Male	1,088	25	27	20	28	100	2.8
Female	1,225	38	30	12	20	100	2.4
Relationship to Head of Household							
Head	1,176	26	29	17	28	100	2.9
Wife	910	40	31	11	18	100	2.3
Other relative	189	33	31	14	22	100	2.6

the study and the desired individual. If the interviewer can impress the value of the research upon the person first contacted, his task in completing the interview will be much simpler. As a result of information acquired from the first call, the likelihood of completing an interview is somewhat higher on the second contact than on the first. The proportions of refusals and respondents not at home decline correspondingly between the first and second calls. Easily contacted respondents, however, are relatively quickly removed from the uncompleted sample; the proportion of responses drops back to the first call level on third and later contacts.[20]

The number of dwellings at which no one can be found at home becomes a progressively larger segment of the noninterviewed sample with each succeeding call. The discovery of data about these persons which would aid in making call-backs on a more informed basis is very difficult. Although neighbors are frequently contacted in an effort to ascertain something about their daily routines, these are usually unknown to the neighbors themselves. Thus, fully 43 per cent of the calls made after four contacts are at dwellings in which no one is at home.

The number of calls required to reach a satisfactory response rate with the Detroit Area Study's sample appears to be considerably larger than those reported for other surveys.[21] As noted above, most of the detailed information now available on this aspect of survey research is derived from studies of non-metropolitan areas. Interviewing mobile metropolitan residents, some of whom live in highly inaccessible apartment buildings, is a much more difficult task than is similar research in smaller communities or rural areas. As the first line of Table 2 indicates, if Detroit Area Study researchers had stopped with just two calls, hardly more than six out of every ten eventual respondents would have been reached. Even three calls would have resulted in a response rate of but 66 per cent, and only three-quarters of the final number of completed interviews would have been accumulated.[22]

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[20] In smaller communities the proportion of responses continues to increase at least through the third call. Williams, *op. cit.;* Lowe and McCormick, *op. cit.*

[21] Stephan and McCarthy, *op. cit.*, p. 242; Lowe and McCormick, *op. cit.*

The fact that some respondents can be easily reached with one call while others require eight or nine contacts before granting an interview would not influence a sample based on only one or two contacts if these groups of persons were alike on *every* characteristic except accessibility. That they are quite dissimilar in many respects is seen in Tables 2, 3, and 4, where selected characteristics of respondents are related to the number of calls necessary to complete an interview.

Demographic Characteristics and Call-Backs. Adults who do not work outside the home are quite easily reached in a fixed-address sample survey. Almost one-half of all unemployed respondents grant interviews on the first contact (see Table 2). Only one-fifth of the employed respondents are interviewed without call-backs.[23] Correspondingly, twice as large a proportion of workers are interviewed after four or more calls (30 per cent) as of nonworkers (15 per cent).

Age bears no constant relationship to accessibility for respondents who are less than 65 years old. Very young adults are about as easily contacted as are middle- or late middle-aged respondents. Beyond age 65, however, the proportion of interviews obtained on the first call rises significantly. The rate of retirement is high in this age group and the general pace of life has slowed. Older respondents, forced to spend many hours in their homes, are quite easily contacted and no doubt welcome the diversion offered by the interview.[24]

Unmarried and divorced or separated adults would be significantly under-represented in a study based on even three interview attempts. These persons have little to keep them at home where they can be conveniently reached by interviewers. On the other hand, widowed adults would be weighted too heavily in the limited call-back survey. A very large proportion of all widowed respondents (45 per cent) grant interviews on the first contact. The comparative ease with which the widowed are interviewed is consistent with the tendency for older persons, many of whom are not in the labor force, to be highly accessible.

Whether or not married respondents are easily contacted is related to the presence or absence of children in the house. If there are children the chances are quite small that both spouses are working. Children act as anchors which keep wives, and probably husbands, where the interviewer can reach them relatively quickly. Married respondents with no children are only slightly less difficult to contact than are unmarried adults.

Men, most of whom are in the labor force and unavailable during the day, are much more difficult to contact than are women. Almost one-half of the male respondents in our sample required at least three calls. Only one-third of the females were equally difficult to interview. The implications of this well-documented finding are obvious for limited call-back attitudinal studies in which sex is an important variable.

The relationship of the respondent to the head of the household is also an important factor related to his accessibility. Wives are comparatively easy to reach while the head himself is noticeably more difficult to interview.

Our data do not reveal differences in accessibility associated with race, residence in the suburbs or the central city, or the place of birth of respondents.

Socio-Economic Characteristics and Call-

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[22] Again, comparison of these figures with comparable data from Elmira and Madison emphasizes the greater effort required when interviewing in metropolitan areas. Williams, *loc. cit.;* Lowe and McCormick, *op. cit.* See also, H. F. Lydall, *British Incomes and Savings,* Oxford: Basil Blackwell, 1955, p. 4; and Cannell, *op. cit.*

[23] All specific statements of percentage point differences and differences in means which are found in the text are statistically significant at the 5 per cent level or better. In computing tests of significance allowance was made for the effects of clustering in the sample. The general conclusions of this paper are also based on statistically significant differences.

[24] Stephan and McCarthy (*op. cit.,* pp. 243–244) cite several earlier studies of call-backs in survey research which reach similar conclusions as to the relationship of accessibility to age and to other variables discussed in this section of the paper.

TABLE 3. DISTRIBUTION OF CALLS FOR COMPLETED INTERVIEW BY SELECTED SOCIO-ECONOMIC CHARACTERISTICS OF RESPONDENTS

Socio-Economic Characteristics	Number of Cases	Percentage Distribution by Number of Calls					Mean No. of Calls
		One	Two	Three	Four or More	Total	
Annual Family Income							
Less than $3,000	264	49	21	10	20	100	2.3
$3,000–$4,999	516	34	31	14	21	100	2.5
$5,000–$6,999	582	31	31	14	24	100	2.6
$7,000–$9,999	505	28	29	14	29	100	2.8
$10,000 or more	368	25	31	20	24	100	2.8
Median income	...	$5,500	$6,250	$6,600	$6,450	$6,100	...
Occupation of Persons Now Working							
Operatives, service workers, laborers	529	24	28	18	30	100	2.9
Craftsmen, foremen	246	21	31	20	28	100	2.9
Clerical, sales workers	291	18	34	17	31	100	3.0
Professionals, managers, proprietors	291	20	32	18	30	100	3.1
Education							
6 years or less	259	33	29	12	26	100	2.7
7–8 years	404	34	28	13	25	100	2.6
9–11 years	580	32	30	15	23	100	2.6
12 years	679	32	29	16	23	100	2.6
Some college	387	30	32	15	23	100	2.6
Mean number of years	...	10.2	10.4	10.6	10.2	10.3	...
Subjective Social Class[a]							
Working class	431	35	30	15	20	100	2.5
Middle class	20	32	32	18	18	100	2.5

[a] Data from 1958 survey.

Backs. Socio-economic status is perhaps the primary "independent" variable in most studies of social organization. Definite evidence is shown in Table 3 that the number of calls a researcher is willing to make influences the socio-economic composition of his completed sample.

Family income and the accessibility of family members are inversely related. The chances of obtaining an interview on the first call approach one in two for respondents whose family income is less than 3,000 dollars annually; they drop to one in four if the respondent's family income is 10,000 dollars or more. The annual median family income in greater Detroit between 1955 and 1957 was 6,100 dollars. A median based on first calls only would have resulted in a figure fully 600 dollars below the over-all median.[25]

The relationship between income and accessibility is probably a result of differential employment rates among families of varying incomes. The more adults in the family who are working, the less likely is anyone to be home at any given time to grant an interview. Also, family income is quite low for older households with no wage earners and increases with the number of workers in a family who contribute to it.

Notwithstanding the relationship between family income and number of calls, additional measures of socio-economic status, such as education, occupation, and subjective social class placement, are not related to accessibility of respondents, at least in the Detroit metropolitan area.[26] This lack of relationship reinforces the view that upper-

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[25] These findings tend to substantiate Parten's claim of the greater accessibility of lower income respondents. Mildred Parten, *Surveys, Polls, and Samples,* New York: Harper, 1950, pp. 413–414.

[26] Nor were occupation and accessibility related in Madison. Lowe and McCormick, *loc. cit.* A slight tendency was noted in Elmira, however, for education and accessibility to vary inversely. Philip J. McCarthy, "Sampling Procedure for the 1948 Voting Study," p. 37, (mimeographed).

TABLE 4. MEAN NUMBER OF CALLS FOR COMPLETED INTERVIEWS BY EMPLOYMENT STATUS AND AGE AND SEX, MARITAL STATUS, AND FAMILY INCOME

Age and Sex, Marital Status, and Family Income	Employed: No. of Cases	Employed: Mean No. of Calls	Not Employed: Mean No. of Calls	Not Employed: No. of Cases
Age and Sex				
21–39 years: men	488	3.0	2.1	38
women	213	3.1	2.3	398
40–59 years: men	354	2.9	1.9	30
women	171	3.0	2.3	256
60 years or older: men	108	3.0	2.4	68
women	22	3.0	1.9	158
Marital Status				
Never married	146	3.5	2.5	37
Divorced, separated	67	3.6	2.2	37
Widowed	55	2.9	2.0	108
Married, no children present	546	3.1	2.3	318
Married, children present	541	2.6	2.0	449
Annual Family Income				
Less than $3,000	76	3.0	2.0	185
$3,000—$4,999	311	2.8	2.0	205
$5,000–$6,999	346	2.9	2.2	236
$7,000 or more	589	3.1	2.1	281

status persons, as such, are not necessarily less accessible than are lower-status adults. The basic consideration in accessibility is whether or not the designated respondent is in the labor force. First calls result in interviews in a disproportionate number of very low-income families because these units are apt to have no working members and are extremely unlikely to have multiple wage earners.[27]

The degree to which accessibility is a function of employment status is emphasized by the data presented in Table 4. Clearly, when employment status is held constant the relationship of age and sex to accessibility disappears. If older women are working, for example, they are as difficult to interview as are young men. The tendency for adults with children in the home to be more easily contacted than others, although considerably reduced in effect, holds whether or not the parent is working. Moreover, among all employed respondents, those persons who are single, divorced, or separated continue to require more interviewer calls than do married adults or widows. Differences in family income which are associated with accessibility disappear completely when the influence of employment status on income is removed.

The traditional characteristics upon which most quota samples are based are age and sex. The relationship of these variables to accessibility appears to be primarily a result of differential employment rates. Quota samplers should consider the possibility of adding an additional restriction, employment status, in the design of their research, particularly when they are surveying communities in which many women are employed, or the number of unemployed and retired is large.

DIFFERENTIAL RESPONSE RATES

An over-all response rate of 87 per cent was cited above for the 1956–58 Detroit Area Study surveys. The response rates for specific population types in the sample, however, do not necessarily match those for the total sample, and data for certain segments of the population may be seriously biased by differential response rates. In fact, considerable variation exists among some subgroups in the degree to which our interviewers were successful in their tasks (see Table 5).

Ninety-one per cent of all adults between the ages of 21 and 34 years in the sample granted an interview. Only 78 per

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[27] "Family Income in Greater Detroit: 1951–1957," *The Detroit Area Study,* 1958 (mimeographed).

TABLE 5. RESPONDENTS AND NONRESPONDENTS BY SELECTED CHARACTERISTICS

Selected Characteristics	Percentage Distribution					No. of Cases
	Respondents	Nonrespondents			Total	
		Refusals	Not-at-Home	Others		
Age						
21–34 years	91	4	4	1	100	918
35–59 years	87	8	4	1	100	1,282
60 years or older	78	12	3	7	100	451
Marital Status						
Never married	82	8	9	1	100	226
Divorced, separated	92	3	3	2	100	114
Widowed	74	12	6	8	100	221
Married, no children present	85	9	4	2	100	1,016
Married, children present	93	5	2	*	100	1,069
Sex						
Male	88	7	4	1	100	1,239
Female	87	8	3	2	100	1,412
Relationship to Head of Household						
Head	87	8	4	1	100	1,356
Wife	89	7	3	1	100	1,027
Other relative	86	7	2	5	100	221
Employment Status						
Employed	89	7	4	*	100	1,536
Not employed	86	8	3	3	100	1,111
Race						
White	87	8	3	2	100	2,220
Negro	91	5	4	*	100	428
Total	87	8	4	1	100	2,651

* Less than 0.5 per cent.

cent of the designated respondents 60 years old or older were interviewed. The likelihood of a refusal increases markedly with age, in Detroit as elsewhere.[28] But refusals are not the only reason for nonresponse from older persons. Physical and mental incapacities, which occur most frequently among the aged, contribute to a lower response rate in this segment of the population.

The high nonresponse rate among older adults contrasts sharply with the extreme ease with which these persons are contacted on the first call. This apparent contradiction emphasizes the conclusion that accessibility and a high response rate are not necessarily found together. Among all persons who eventually are interviewed, adults over 65 years of age are decidedly more likely to grant an interview on the first call than are respondents of any other age; when all possible respondents are considered, however, older residents are also much more likely than are younger persons to refuse or to be incapable of granting an interview. The negative influence of age on response rate is evidenced in the low percentage of widowed adults who grant interviews. Only three out of every four widows or widowers in the original sample were interviewed. Both refusals and illness played important roles in the large number of nonresponses shown by this group.

Single adults also tend to have rather low response rates. The nonresponse of unmarried Detroiters is not solely a result of refusals; one-tenth of the single adults in our sample were never contacted by an interviewer. Whether or not many of the designated respondents who are impossible to find at home are simply refusing by avoiding the interviewer is unknown.

Childless married adults have a somewhat lower response rate than do married adults with children. A disproportionate number of designated respondents with no minor children in the home refuse to be interviewed. These persons are older, on the average, than adults with children, a fact which may explain at least some refusals in this group. The data indicate, however, that even when age differences are controlled, childless adults are slightly less likely to grant an interview than are married persons living with their children. Perhaps those parents who know that they must be home with the children whether or not they are interviewed, are therefore more willing than otherwise to sacrifice an hour of their time in the interests of social research.

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[28] Lowe and McCormick, *op. cit.;* Stephan and McCarthy, *op. cit.,* p. 262.

Sex, relationship to head of household, employment status, and race are not highly associated with differential response rates. Notwithstanding the relative inaccessibility of men, household heads, and workers, these persons do not contribute higher than average nonresponse rates. Although gaining a completed interview with these respondents requires several call-backs, this fact does not mean that they are likely to refuse or to remain almost permanently inaccessible.

The income, occupational status, and educational levels of nonrespondents were not available. But an indication of the socioeconomic status of nonrespondents who reside in Detroit is provided through the use of data from the 1950 Census. Analysis of rental distributions for the 1955 Detroit Area Study's survey reveals a slight underrepresentation of middle level rental units in the sample.[29] In general, however, the median rental of the blocks in which nonrespondents are found is quite comparable to that of the city population as a whole and quite within allowable sampling error limits. The 1950 median rental of 1955 nonrespondents was 46 dollars; the comparable figure for the total city was 44 dollars. These data do not substantiate the rather common claim that upper socio-economic groups contribute a disproportionately large number of final nonrespondents.[30]

Little evidence exists in the data to support the proposition that refusals and not-at-homes tend to cancel one another.[31] Although refusals and age vary together, the proportion of not-at-homes is not related to age differences. Widowed adults have a high refusal rate *and* at least an average proportion of not-at-homes. Also, while unmarried Detroiters are very difficult to contact, almost as much nonresponse in this group is due to refusals as to not-at-homes.

SAMPLE BIAS DUE TO NONRESPONSE

Although nonresponse rates for a few segments of the population are rather high, this variation does not necessarily imply that strong biases exist in carefully planned probability samples. Table 6 presents some support for the claim that relatively small biases occur in a probability sample of the type described here when the over-all response rate is reasonably high.

Seven characteristics of actual respondents and of all possible respondents in the original sample are compared in Table 6. Twenty-one specific comparisons are made and in only one instance does the bias in the completed sample, which derives from a failure to obtain a 100 per cent response rate, exceed two per cent.[32] The sample overestimates the proportion of husband-wife-children family units by 2.5 percentage points. This and all other biases shown in Table 6 are in the directions which would be expected from earlier discussions.

There is no claim here that possible sample bias should be ignored. The objectives of a given research may conceivably dictate that a two percentage point error is unacceptable. In such instances the researcher may choose to incorporate the bias due to nonresponses into the total error of the survey estimates, using methods detailed in the literature.[33] Or, he may choose to handle

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[29] John Takeshita, "The Interview Response Rate for the 1954–55 Detroit Area Study." *The Detroit Area Study,* 1955 (mimeographed).

[30] See, e.g., Parten, *op. cit.,* pp. 412–413.

[31] Berelson, Lazarsfeld, and McPhee, *loc. cit.;* Stephan and McCarthy, *op. cit.,* pp. 266–269; Helen Crossley and Raymond Fink, "Response and Non-Response in a Probability Sample," *International Journal of Opinion and Attitude Research,* 5 (Spring, 1951), pp. 1–20.

[32] Comparatively small biases are also reported for the Elmira study. Stephan and McCarthy, *op. cit.,* pp. 266–269. Examples of surveys where large nonresponse rates resulted in dangerously large biases are found in Parten, *op. cit.,* pp. 404–417.

[33] See, e.g., Z. W. Birnbaum and Monroe G. Sirken, "On the Total Error Due to Noninterview and to Random Sampling," *International Journal of Opinion Attitude Research,* 4 (Summer, 1950), pp.

TABLE 6. RESPONDENTS AND TOTAL SAMPLE BY SELECTED CHARACTERISTICS

Selected Characteristics	Percentage Distribution: Respondents	Percentage Distribution: Total Sample	Percentage Point Difference
Employment Status			
Employed	58.8	58.0	+0.8
Not employed	41.2	42.0	—0.8
Total	100.0	100.0	—
Age			
21–34 years	36.4	34.6	+1.8
35–59 years	48.1	48.4	—0.3
60 years or older	15.5	17.0	—1.5
Total	100.0	100.0	—
Marital Status			
Never married	8.1	8.5	—0.4
Divorced, separated	4.5	4.3	+0.2
Widowed	7.1	8.4	—1.3
Married, no children present	37.4	38.4	—1.0
Married, children present	42.9	40.4	+2.5
Total	100.0	100.0	—
Type of Dwelling Unit			
Apartment house or hotel	9.3	10.0	—0.7
Other multiple dwelling	25.1	25.0	+0.1
Single family dwelling	65.6	65.0	+0.6
Total	100.0	100.0	—
Sex			
Male	47.0	46.7	+0.3
Female	53.0	53.3	—0.3
Total	100.0	100.0	—
Relationship to Head of Household			
Head	50.9	51.2	—0.3
Wife	39.3	38.7	+0.6
Other relative	8.2	8.3	—0.1
Nonrelative	1.6	1.8	—0.2
Total	100.0	100.0	—
Race			
White	83.0	83.8	—0.8
Negro	17.0	16.2	+0.8
Total	100.0	100.0	—
Number of cases	2,313	2,651	—

this problem by adjusting his completed sample for nonresponse bias.[34] Nonetheless, for most surveys, biases of the magnitude reported here are quite reasonable and would generally have little influence on the final product of the analysis.

CONCLUSION

The ability of the student of human populations to draw a sample which is representative within known confidence limits of a given universe is well established. Even perfectly selected samples, however, can result in very unrepresentative units of observation if the designated sample varies substantially from the final product. The problems of varying accessibility among urban residents, differential response rates, and sample bias due to nonresponse have been discussed in some detail. The experiences reported here, we hope, will benefit future investigators who plan to employ survey techniques in the study of human populations.

179–191; William G. Cochran, *Sampling Techniques,* New York: Wiley, 1953, pp. 292–298.

[34] For clear descriptions and defenses of this procedure, see Moser, *op. cit.,* pp. 139–143; and Hansen, Hurwitz, and Madow, *op. cit.,* pp. 56–59.